FAQs – Open Manufacturing Industry Day Series

These questions have been raised at the three Open Manufacturing Industry Days and have been edited for clarity. The below questions and answers take precedence over the Q&A sessions at the meetings.

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GENERAL INFORMATION

Q: The Adaptive Vehicle Make (AVM) briefing showed that the design, integration, and testing time for defense systems has increased as those systems have become more complex – but the development time for modern automotive systems, which have become as complex as defense systems, has actually decreased. Why has the automotive industry been able to reduce the development time, but defense has not?

A: The defense industry tends to purchase equipment with a "Buy-before-make" approach. Once a requirement is established, development is funded to meet the requirement – an acquisition process that inherently incurs very high development and bureaucratic overhead costs. AVM is aimed at achieving a "Make-before-buy" strategy to dramatically reduce acquisition costs and shorten development times. Additionally, the most sophisticated and forward-leaning of the automakers do practice platform-based design methods—analogous to those being pursued in META—in some domains within the automobile, notably electronics and safety systems. And finally, there is a significant difference in the scale of production and extent of variability of designs between defense and automotive.

Q: How would the Open Manufacturing program stimulate manufacturing on U.S. soil and keep it there?

A: Open Manufacturing is aiming for a "sustainable model" – manufacturing in the U.S. that is globally competitive. This is not strictly a matter of cost: other countries (notably Germany) have maintained or achieved positive manufacturing trade balances, albeit with higher domestic energy and labor costs. This is the challenge for the U.S. industry. Make it efficiently enough here so that it does not go overseas.

Q: DoD requirements drive cost and manufacturing time for some defense industries. How will Open Manufacturing address the requirements issue?

A: The requirements "culture" can indeed be a barrier to reducing manufacturing time and cost. Open Manufacturing plans to foster a culture change akin to that associated with changing from a RFP (driven by specific requirements) to a BAA approach. We invite responses that will enable rapid and adaptive manufacture of products.

Q: Will a BAA – or perhaps multiple BAAs – be released to address the program being addressed today?

A: DARPA plans to have the BAA following the third Industry Day. Options being considered include multiple BAAs or a single BAA.

Q: The Open Manufacturing program is focused on U.S.-based manufacturing. Will the global community be included?

A: This initiative is open to everyone, and not limited to U.S.-based companies/institutions. Our emphasis is clearly to make investments in the United States, good models that exist elsewhere should be exploited. The mandate for Open Manufacturing is to go for the best-in-class (technology or approach), wherever that is found in the world.

Q: How will Open Manufacturing deal with ITAR issues?

A: DARPA takes great strides to address ITAR issues as early and as effectively as possible. Although in many cases International Traffic in Arms Regulations (ITAR) are clear-cut, dual-use technology can sometimes be challenging to categorize. DARPA will carefully address ITAR issues on a case-by-case basis.

Q: (i) How big is the Open Manufacturing program? (ii) How many awards does DARPA plan to make? (iii) What is the program's planned duration? (iv) Will DARPA pay for recapitalization? (v) How much of that budget could be viably put into a single effort?

A: (i) The current budget for Open Manufacturing is approximately $130M-$135M over a 3-4 year timeframe. Considerable funding is being invested in other DARPA programs, e.g., iFAB and META, so the whole DARPA portfolio is relatively large.

(ii) While the number has not yet been determined, multiple awards may be expected. This depends on the merit of ideas and availability of funds.

(iii) As currently envisioned, the program is expected to have a duration of 4-5 years, starting in FY11 and building through FY14.

(iv) Typically DARPA does not pay for capital equipment, and DARPA does not construct buildings – DARPA funds technology development and exploitation. DARPA could, for example, engage in "Agreements" where the company puts in 50 percent in the form of capital and DARPA funds the technology development.

(v) It is not predetermined on how the funds will be spent.

Q: There is a disconnect between this push to establish a manufacturing capacity and DARPA's inability to fund capital equipment. How does Open Manufacturing plan to implement attractive technologies, given today's capital markets and the general lack of money available to businesses?

A: Open Manufacturing aims to develop processes and capabilities for manufacturing to enable U.S. manufacturers to make and sell qualified/certified and competitive products for Defense and National needs.

Q: Is there an interest in commercial technologies?

A: One of our evaluation criteria is potential contribution and relevance to the mission and is focused on national security. The argument is often made that a strong commercial and manufacturing base is integral to our national security. A sustainable defense model

frequently requires a commercial outlet for technology – otherwise DoD could not buy the technology at a reasonable price in a reasonable amount of time. DoD can often benefit substantially by modifying a sustained commercial process with reliable output, even though it may incur a small compromise in performance.

Q: What is the relationship between the Open Manufacturing program and the DoD manufacturing technology community that is focused on manufacturing and S&T investments?

A: DARPA's Open Manufacturing program seeks new manufacturing processes, methods, and business practices to improve existing manufacturing facilities, create new, radical process technologies, and address the qualification/certification issues.

Q: Will DARPA be looking toward a DoD Memorandum of Understanding (MOU), a Memorandum of Agreement (MOA), a Program of Record, or an office like MANTECH to ensure transitions?

A: The current plan is to not necessarily require an MOU or an MOA for a "hard" transition. Transitions are a clear priority, and one of the evaluation criteria will be the degree to which proposed efforts meet the DoD mission and articulate a clear transition path to insertion into the military services. This could be done in many ways, e.g., an MOU or MOA, or the establishment of a capability that is fed into Program(s) of Record without requiring an MOU or MOA.

Q: The DoD MANTECH program has separate categories, e.g., composites, electronics, etc.. Will Open Manufacturing proposals be combined so that electronics companies will be competing against composites companies?

A: All ideas will be evaluated according to the published criteria. Open Manufacturing could conceivably end up with multiple awards in one domain (e.g. composites) or multiple domains (e.g. composites, titanium components, etc..).

Q: One of the biggest challenges appears to be information exchange between entities. How will protocols be mandated?

A: A system's ability to communicate with other elements will definitely be considered in the evaluation. A process that operates in isolation and cannot be integrated into an overall system is not useful or helpful to this program. DARPA's Tactical Technologies Office is working the protocols and communications through its programs, e.g., META.

Q: What is the Department of Energy's interest in manufacturing?

A: Several recent USG documents have explained that DOE – specifically the Industrial Technologies Program within DOE's Office of Energy Efficiency and Renewable Energy (EERE) – has been given a role and some responsibility in manufacturing. In fact, several DARPA technology efforts have very productively involved DOE, e.g., amorphous metal coatings, DARPA's Titanium Initiative, solar cells, and other energy projects. Besides DOE, there is also a role in manufacturing for the Department of Commerce (e.g., the activities of the National Institute of Science and Technology). In

all likelihood, multiple elements of the U.S. Government will also be involved, in separate but coordinated activities.

Q: You gave an example involving satellites where you tried out this foundry idea, and it has worked for that. How does this translate to other platforms and applications?
A: The main success with satellite technology that we've found so far in the Operationally Responsive Space (ORS) Office - which is very much an experiment - is in managing the interfaces. This enables outreach to multiple platforms and technologies, reduces cost, increases reuse and reduces cost. ORS has adopted the role and responsibility of publishing and maintaining systems and standards work, which is the biggest cross-platform issue being faced.

Q: Will the BAA allow for "add-on" work to an existing program/foundry development?
A: We will employ the most appropriate instrument available for a selected proposal.

Q: Does DARPA expect IP rights on participant data?
A: Depending on the instrument employed, IP disposition is subject to the applicable regulations (e.g. Federal Acquisition Regulations). With "Other Transactions", the IP rights are subject to negotiations. DARPA protects background IP and will negotiate foreground IP.

Q: Will all the presentations from the Industry days be posted to a website?
A: Yes, presentations are posted on the DSO webpage at http://www.darpa.mil/Opportunities/Solicitations/DSO_Solicitations.aspx

Q: Please explain more about the Defense Contract Audit Agency (DCAA).
A: To obtain a cost-reimbursement contract with the U.S. Government, organizations must have an accounting system approved by the Defense Contract Audit Agency. Please browse the Internet for "DCAA" for local contact and other information.

Q: What are the relevant websites for small business and access to them?
A: SBIR information may be accessed through the DARPA and/or OSD websites at http://www.darpa.mil/Opportunities/SBIR_STTR/SBIR_STTR.aspx or http://www.acq.osd.mil/osbp/sbir/

Q: Will there be a draft BAA date? A final BAA date? And an awards date?
A: There will not be a draft BAA. DARPA plans to have the BAA out following the third Industry Day.

Q: Would DARPA fund a complete non-defense application?
A: The second criterion for proposal evaluation at DARPA is: "Relevance to the mission of the Agency and DoD." Failure to establish that relevance will be taken into account during the evaluation of proposals.

Q: Is the DARPA technology/process for GCV going to be shared or turned over to TARDEC/Army for follow-on use?

A: The process and supporting tools resulting from Adaptive Vehicle Make will enable rapid development of complex cyber-physical systems (to include, but not limited to systems such as an infantry fighting vehicle like the GCV). We foresee this capability being utilized by a broad spectrum of developers. As the lead integrator of ground vehicles for the military, TARDEC will certainly have great use for this process, but AVM ultimately enables both traditional and non-traditional developers to contribute to system design in a way that was not open to them previously. Our intent is that the process and tools will be available to anyone and everyone who can contribute.

Q: What about the cultural change required to make Open Manufacturing successful?

A: This is probably our most difficult challenge. This program's success depends on everyone being an agent of change. This program needs to be socialized throughout the enterprise, including conversations with management, investors, and clients.

Q: Defense companies are constrained by the Federal Acquisition Regulations to allowable profit levels on Government contracts – Cost Plus Fixed-Fee – between 8-10 percent, and on Firm, Fixed-Price contracts to 15 percent.

A: There are no limits to profit on fixed price contracts but see DFARs 215.404-70 for profit guidance.

Q: We have manufacturing overseas. If there is a technology output from this, are we limited to where we practice the result?

A: No. Except for activities that are classified or fall under International Traffic in Arms Regulations (ITAR) or Export Administration Regulations (EAR). Performers that own the intellectual property and may exercise it however they wish. DARPA's goal, is of course, to make this process so efficient here that there is no advantage to taking it outside the United States!

Q: Is anyone working on legislation to allow DARPA or others to determine what level of product is truly intellectual property? There are no clear boundaries at this time, and companies always choose conservatively, which inhibits development by outside companies.

A: The emphasis of this program is on the science and technology of manufacturing. The issue of intellectual property is a difficult one, and there is a great effort within the U.S. Government to address the issues of intellectual property and competitiveness. DARPA's mission is to be DoD's primary engine for technology innovation. DARPA is not responsible for framing either legislation or Government policy.

Q: Does the proposed program need to be compatible with META and other TTO manufacturing programs?

A: DARPA is one Agency and these are all programs within one of DARPA's portfolios, so compatibility is preferred. The META language should be used as much as possible.

In DARPA's vision, a process developer in open manufacturing should plan that his/her module one day will go into iFAB.

Q: Would DARPA allow the purchase of capital equipment? For example, a digital manufacturing machine that would be a dedicated platform for added instrumentation to provide the information content needed for predicting properties.

A: By statute, DARPA does not build buildings, buy land or facilities, or commercial, off-the-shelf equipment (e.g., to be used for production or "making things") – DARPA does not have that kind of funding. DARPA *may*, however, pay for purchase or construction of test equipment – but only with the approval of the Contracting Officer.

Q: How does DARPA coordinate with the Army, the Navy, etc., who are doing pieces of Open Manufacturing?

A: To the best of its abilities, DARPA coordinates its manufacturing portfolio with those of the Military Services and other U.S. Government agencies. There is no pretense that DARPA is fully aware of all the other USG activities in manufacturing. If proposers are aware of potential synergies with other Government or industry activities they should outline them in their proposal.

Q: Can you describe the development of a JSF under the model you propose if it were conducted 10 to 15 years from now in a vibrant, open manufacturing ecosystem? What would be the roles of big and small players, risk-sharing, etc…?

A: DARPA's Open Manufacturing vision is that the next complex system could utilize *manufacturing informed design*, in which system designers can reach out, access and modulate design modules that represent the actual process models for manufacturing specific parts, including cost and probability of yield. That kind of information and design process democratizes design of complex systems like JSF.

Q: Will DARPA be the actual contract awarding entity?

A: Yes. Given the program's complexity and the need for flexibility.

Q: What role will FFRDCs – specifically National Laboratories – be able to play in this BAA as partner to prime or prime?

A: Federally Funded Research and Development Centers (FFRDCs) and Government entities (Government/National laboratories, military educational institutions, etc.) will be subject to applicable direct competition limitations and could not propose to this anticipated BAA in any capacity unless they addressed the following conditions. FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector AND must also provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to government solicitations and compete with industry, and compliance with the associated FFRDC sponsor agreement and terms and conditions. This information is required for FFRDCs proposing to be prime or subcontractors. Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide

written documentation citing the specific statutory authority (as well as, where relevant, contractual authority) establishing their ability to propose to Government solicitations. At the present time, DARPA does not consider 15 U.S.C. 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C. 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the Proposer.

Q: Will this program partner with DOC or DOE?

A: If it is appropriate, yes. The goal of Open Manufacturing is to invest in technology to *make* things, not evaluate business postures or competitive positions. DARPA will work closely with colleagues at the Departments of Energy and Commerce, with the potential goal of establishing MOAs with both Departments on a project-by-project basis. Whether blanket MOAs will established remains to be seen.

Q: Who decides which aspects become open?

A: This will be decided by negotiation. The interface protocols (input/output) will definitely be open: complete "black boxes" where no visibility exists and in which trust cannot be established will not be funded. Within those domains, negotiations will be conducted as to what makes sense. Open Manufacturing demands open architecture, not necessarily open-source. DARPA protects Intellectual Property according to the applicable laws and regulations.

Q: Who are the MDFs?

A: Since Open Manufacturing must be able to perform protected (i.e., classified and proprietary) as well as open work, one straightforward way to deal with the MDFs is to have at least some of the MDFs be FFRDCs or Government Labs. Complementary public/private partnerships are also desirable, with strict rule-based guidance for contractor management, control, and operation of the non-FFRDC MDFs. The overriding principle is that "simple is best," i.e., minimal bureaucracy and few managerial layers.

Q: Can the proposer be the MDF?

A: Yes. A proposer may either be an MDF or the coordinator of the MDF(s). MDFs do not have to be a single physical entity: they could be distributed.

Q: Do we need to have an acquisition customer endorsement?

A: No. That would be nice, but it is not a requirement of this program.

Q: Is transition to warfighter (sellable product) a typical requirement?

A: It is a desirable attribute, but not a requirement. U.S. warfighters are obviously central to the U.S. national security. But for every person at the point of the spear (the "tooth"), there are hundreds and thousands behind in the supporting infrastructure (the

"tail"). The focus of Open Manufacturing does not always have to be fixed on the warfighter.

Q: How can we best share with the DARPA program managers our thoughts and approach to the issues discussed here today?
A: This program actively solicits everyone's feedback and input. Please e-mail the program manager at DARPA-SN-11-31@darpa.mil. Once a BAA is issued, procurement regulations prohibit exchange of questions and answers specific to individuals or proposals. Potential proposers may submit questions, and those questions will be posted (without attribution) on a specified website, along with the answers, so everybody has exactly the same information and no one has an unfair advantage.

Q: You said that the BAA is expected by the end of the month/April. The money is mostly FY12, so when do you anticipate awards, and when do you anticipate getting the money out? Are you going to be issuing another BAA in FY12?
A: Refer to the BAA for further guidance.

PROPOSALS
Q: Is there interest in white papers prior to the BAA and before proposals?
A: We are currently planning not to request white papers.

Q: If you don't follow a preliminary white paper process, proposers run the risk of developing proposals at great expense without knowing whether they are even close to the mark. Will proposal abstracts be solicited for the Open Manufacturing BAA?
A: This is the down-side of not having a white paper submittal phase, and we understand the criticism. But this is the rationale for holding these Industry Days – to vet as many questions as possible. Clarifying questions can always be submitted at any time. They will be posted without attribution on the program website FAQs so that, in the interest of fairness, everyone can see all questions and answers.

Q: What manufacturing areas do you expect the proposals to focus on? Is pharmaceutical manufacturing within the scope of this initiative?
A: The scope of the Open Manufacturing program is limited to manufacturing technologies that are applicable to the fabrication of military systems. Manufacturing dealing with pharmaceuticals and software development will not be part of this program. Topics of specific interest include composite manufacturing (metal, ceramic and polymer), net shape titanium and other metal parts, roll-to-roll processing, joining, and others.

Q: Do you have best-in-class examples of good proposals?
A: Very strict controls are placed on proposals when they are submitted to DARPA. A proposal arriving at DARPA is treated in strict confidence. By law and regulations, it is an offense for a proposal to be given to anybody else. Proposals are not accessible online. Proposals are evaluated by U.S. Government personnel and Subject Matter

Experts (SMEs) who have signed agreements and are under the same rules as DARPA employees. DARPA does not conduct peer-reviews of proposals, e.g., they are not sent out to academics or other people to read and evaluate. Evaluations are strictly internal.

Evaluation of proposals will be accomplished through a scientific/technical review of each proposal using the following mandatory criteria: (a) Overall Scientific and Technical Merit; (b) Potential Contribution and Relevance to the DARPA Mission; and (c) Cost Realism. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

Q: Is there an advantage to submitting an integrated proposal with all six elements, or should they be submitted separately?

A: Proposals may address any one or all of the task elements. If a proposal addresses only one or two of the task elements, it should explain how the proposed work will be integrated with the other Open Manufacturing task elements.

Q: The discussion of examples focused on higher tech capabilities and products. Is the program open to lower tech processes and products? Low-tech still represents a significant portion of manufacturing money.

A: This is a DARPA program, and the second proposal evaluation criterion has to do with the mission of the agency and the DoD: DARPA's mission tends to focus on high-tech, but that is not an exclusive emphasis. Regardless whether the value-added from the proposed activity derives from pursuit of high- or low-tech capabilities and products, we are interested in high-impact/high value added products and proposers should justify their choice of effort/process/approach etc.. The Government evaluation team will be looking for justification for DoD's interest in the outcome.

Q: What time span is appropriate? Is 48 months too long? Are you looking for 12 months? 24 months? 36 months?

A: Whatever makes sense for the project. The evaluation criterion of cost reasonableness should be carefully followed. The team will pose a problem, an answer, a cost, and a schedule – which will be judged as a package based on overall credibility and reasonableness.

Q: Do you envision programs that are phased? Are you looking for milestones, like gates for entry into the next proposal phase?

A: Metrics are required to ensure that a program is making progress and is on the path to success. In fact, Technology Investment Agreements require payable milestones, whereby performer payment depends on reaching agreed-upon milestones.

Q: Is there a page limit for the proposals?

A: The technical volume will have a page limit, generally the limit is 40 pages. The cost volume does not have a page limit. The baa will state the number of pages for each section of the technical proposal.

Q: Would [insert proposed approach] be of interest to the program?

A: DARPA cannot comment on the likely content of any potential proposal and will evaluate all proposals that are submitted under the Open Manufacturing BAA.

COSTS

Q: Does Open Manufacturing consider the life cycle costs for optimization of manufacturing costs?

A: Yes.

Q: Are maintenance and inspection permissible design variables?

A: Yes.

Q: Describe the kind of funding to be provided for Open Manufacturing, and the starting Manufacturing Readiness Levels (MRLs) expected for this effort.

A: DARPA's primary budget categories are 6.1 (basic research programs), 6.2 (applied research programs), or 6.3 (advanced technology development programs). The funding currently in the budget for Open Manufacturing is 6.2; we have very little 6.1 funding, which could go into some of the modeling work or some of the testing protocols. The MRL levels for this program are wide open.

Q: What will cost-share requirements be, if any?

A: Cost sharing will be considered.

Q: Is funding available for capital equipment and tooling in an advanced manufacturing process?

A: DARPA could potentially fund the development of new equipment but will not fund facility construction and capital equipment.

TEAMING

Q: Will the BAA be structured such that DARPA is looking for a few large, highly coordinated teams to provide a whole solution? Will smaller, focused research projects on individual topics be allowed?

A: Open Manufacturing seeks both. DARPA encourages proposers to put forth their best approaches and optimal team structures to address the challenges articulated by this program. Whereas highly coordinated teams have their strengths, it may be that major strides could be taken by an *ensemble* of separate, very good ideas.

Q: Let's say that an academic institution has a bright idea, but has industrial partners. Could that academic institution take the role of a prime?

A: Yes.

Q: Any preferences on how to handle contracts to subs or teams?

A: One of the proposal evaluation criteria is the capabilities and expertise of the proposing team. The teaming arrangement – and there can be many variations – should be whatever is best for the work being proposed. The teaming rationale should be fully articulated when the business plan is assembled. The structure for the team's technical management and execution of the work should be explained, with discussions of the work- and cost-efficiencies made possible by the proposed teaming arrangement.

Q: What is the role of universities in the upcoming BAA? Can universities be the prime, e.g., an Advanced Manufacturing Institute with industry partners in an industrial park?

A: Yes. Universities can bid one small part where they would like to compete, or they can be members of a larger team, or they can be the lead on that team – there are no constraints. The university role should be that which best suits the proposed activity and the team.

Q: Does this BAA have any preference for academia-led versus industry-led efforts?

A: No preference. The best ideas win: the top proposal evaluation criterion is technical merit.

TECHNICAL

Q: Is my topic consistent with the objectives of the anticipated BAA?

A: DARPA is not able to comment on or suggest specific research approaches, or the likely content of any potential proposals.

Q: DARPA's FANG program does not include the Ground Combat Vehicle (GCV). Will a different set of standards be used to evaluate designs submitted under FANG from those used by the DoD to evaluate GCV designs?

A: While the GCV is a seven-year development program, AVM seeks to develop a fully functional, fieldable fighting vehicle in 1-2 years – so the requirements will be <u>somewhat</u> different. The GCV design must have huge margins built in to anticipate incorporation of new operational and survivability packages to meet threats and conditions that could emerge over a couple decades. AVM will use a much more narrowly focused set of requirements based on operating conditions and operations anticipated on a much shorter timeframe. Instead of refitting the entire fleet every 30 years, AVM could refit parts of it every 3-4 years. We anticipate that the FANG vehicle would, however, be designed to the same core set of payload, mobility, and protection requirements as the GCV.

Q: Is the ability to modify designs for unexpected loading scenarios a consideration?

A: Yes. As indicated in the Industry Day announcement, Open Manufacturing aims to build parts "fit for intended use" to capture both typical and unexpected loads or low probability events.

Q: How will Open Manufacturing address risk management?

A: Risk is a very important design variable. Failure cannot be an option in some high-integrity programs – particularly when it comes to consideration of human life, e.g., aircraft and combat vehicles. In such cases, risk is most definitely a design variable.

Q: Will the program's communication protocols take into account legacy software compatibility, adaptability, and conversion issues?

A: Yes. Legacy software, etc.. must be adapted and made available with the rest of the infrastructure.

Q: Will DARPA require open-source, publicly-downloadable software in developing this program?

A: Not necessarily. As long as communications and interactions proceed successfully, what's "inside the boxes" is not necessarily to be open source. But DARPA will require many pieces of information regarding the software "handshake(s)" with other system elements, e.g., What is the output and why? What is the fidelity of the data package (e.g., probabilistic characterization)? What data came from models? What data came from experiments or heuristics? What is the version control? What is the communications protocol? In short, to certify the data and establish its heritage, everything that the developer knows about his data package and how it was developed must be made available and clear through these protocols, so that the users can effectively exploit the output.

Q: Given that software is so integral to many of the complex systems in manufacturing today, is reducing the timeline for software development a legitimate topic for this initiative?

A: This is not a generic software development effort. However, manufacturing process models, testing protocols, etc. are legitimate topics for consideration.

Q: Descriptions of the Manufacturing Development Facilities (MDFs) refer to a "virtual library." Will this virtual library have a "librarian"?

A: While locations have not been decided, one consideration is to locate MDFs in FFRDCs or USG facilities so that the information could be rigorously controlled and protected. As in past DARPA efforts, classified, proprietary, and open materials will be treated according to strict access and handling guidelines relevant to each. Libraries of these data – and their "librarians" – will likewise be placed in locations consistent with the respective access and handling requirements.

Q: The scope of this program appears to include developing new ways to manufacture items with existing technologies, versus generic processes that apply to multiple industries and multiple kinds of equipment. Is this program aimed at one or the other?

A: The scope of this program is very broad and welcomes all creative manufacturing ideas and approaches. New manufacturing processes are highly encouraged, e.g., biomimetic processes that might enable a new generation of focal plane arrays to be developed for the DoD that – much like the human eye – use ambient temperature

fabrication processes. We are looking for rapid, adaptable, efficient and low cost processes.

Q: To what degree might purely commercial, i.e., non military foundry facilities be considered in this program?
A: They will be considered – U.S. Government or military laboratories are not automatically deemed better suited to perform in this element of the program than anyone else. Examples abound where government work is performed in the commercial sector, e.g., defense contractors. It is also possible to leverage the huge investment the nation has made in the U.S. National Infrastructure, whether supercomputers or other equipment in U.S. National Laboratories. There is no inherent bias for or against commercial entities.

Q: To what degree will a purely commercial product and process effort be viewed favorably, given that it provides a novel model or pattern for rapid deployment of reconfigurable manufacturing systems?
A: As in all proposals, the case must be made that the commercial production capability could be used for DoD applications as well. There is probably very few products, processes, or technology that DoD would not be interested in vis-à-vis a military application or other DoD benefit. DARPA's role is to avoid and enable technological surprise, and the sources of products, processes, and technologies of potential interest cannot be predicted.

Q: How will this development of systems and software be validated? Through what process?
A: This program has issued the challenge, but does not propose to specify how to solve the problem. This will be a BAA not a RFP. This is a self-written exam: proposers are to write both the questions and provide the answers.

Q: Are problems related to logistics, material handling, storage and retrieval in scope?
A: If the manufacturing process is a logistics-limited process, and that's what's holding the rapid implementation of technology up then techniques and technical approaches that solve a logistics problem would be acceptable. Proposals should clearly make the case connecting the logistics technical solution to a specific DoD manufacturing problem.

Q: Are assembly and repair problems in a flexible manufacturing context in-scope?
A: The "manufacturing" context of Open Manufacturing is not about just making the product, but making the product and assuring a fitness for use, including long-term use lifecycle costs. Maintenance of the part down the road absolutely includes design for maintainability: the part should be designed so it can be maintained on an aircraft or a vehicle or a multichip module.

Q: Are chemical process systems within the scope of this program?
A: Yes. Chemical processes e.g., recycling or catalytic separation processes to support manufacturing, such as rare earth and other element recovery from electronic scrap are in

scope. And biological process systems that contribute to manufacturing are also of interest.

Q: Though focus is not on software, a major thrust is software-based tools for manufacturing, right?

A: Correct. The interest is in process models. Without process models, it is hard for any design tool to interact with that process. It is hard to modulate a design based on manufacturing if there is no way to communicate with that manufacturing concept. A proposal regarding an existing process to be captured in a sophisticated tool so that it can interact with other design tools and performers would certainly be of interest.

Q: When we propose, should we describe a product we make with the process, or should we focus on process-only without a specific product? Should there be a product we use as a model?

A: Yes to the second part of the question. For example, if a process is proposed for accelerated manufacturing and a tool is delivered, e.g., a software tool, how is its performance verified? It is unlikely that one tool and one approach will work across all domains. The tool must be demonstrated over the range of applicability to show the merits of the approach (with embedded "flags" to indicate where an intended application exceeds the validated performance space of the tool). At least one "deep-dive" must be performed that focuses on a good, specific example, a good product resulting from the tool that is taken all the way through the manufacturing process.

It is prefered that this be priced as options in a proposal, affording DARPA an opportunity to fund the work incrementally.

Q: Time: Important to predict, or important to minimize?

A: It is important to both predict and minimize, but time must be minimized. The focus is on a short period of time, whether from concept-into-flight, concept-into-use, or concept-into-implementation. And change must be accomplished with predictability. We are looking for predictable flexibility, agility and rapid manufacture.

Q: In regard to the BAA: is a specific application of open source responsive? For example, proposing porting or manufacture of a product to mass-production, readily available COTS processes from specialty processes – this takes advantage of economies of scale and applies to small batches. Is porting of manufacturing processes of this sort responsive to the BAA?

A: This program welcomes proposals from anyone knowledgeable about existing manufacturing processes, technologies, and best practices in the commercial world that are not being exploited well by DARPA or DoD. Specifically, proposers seeking to port these capabilities into the Open Manufacturing library for use in design and manufacture of parts and components should show how these processes and technologies will interact with any/all of the six program elements, e.g., rapid qualification or rapid production.

Capabilities of interest to this program are not just limited to U.S.-based contributions – great ideas are welcomed from anywhere in the world. In fact, other cultures may see the

same problem from a slightly different perspective, which can be very informative and productive.

Q: Is the focus on new processes or process models? For example, simulation?
A: Both are of interest. Proposers should remember DARPA's interest in doing the hard parts – the revolutionary parts – of the problem that will enable big leaps. Proposals judged to be evolutionary are not likely to be highly ranked.

Q: Would process modeling and simulation tools for optimization fall into this BAA?
A: Yes.

Q: How important is the ability to model material characteristics to your program?
A: It is important only if ability to model material characteristics is a part of the proposed activity.

Q: Is modeling and simulation part of your program?. For example, identifying issues before manufacturing any parts?
A: Yes.

Q: As an example, are you looking for a new manufacturing process that would make robot parts, or new underlying processes that could be used to make robot parts as well as other things?
A: Yes.

Q: Problems that are simple to state (e.g. traveling salesman for packing) have exponential complexity (NP-complete). Why do you think that a complex problem such as manufacturing has a low enough complexity addressable by an 'open' approach that is independent of the specific product in question for each manufacturing instance?
A: We do not think that manufacturing is independent of the specific product. This program is aimed at electromechanical components (e.g. not pharmaceuticals). It is not clear that Open Manufacturing has a simple solution. That's why DARPA is interested in working with interested parties to see if there is one.

Q: Is this program restricted in terms of application to only DoD programs? Can applications such as wind energy be one of the manufacturing demonstration applications?
A: Yes. Wind energy is actually of great interest to both the DoD and the DOE. The DoD is interested in developing independent electric power sources for forward operating bases (FOBs) to avoid having to transport fuel over-land by convoy, inherently a high-risk military operation.